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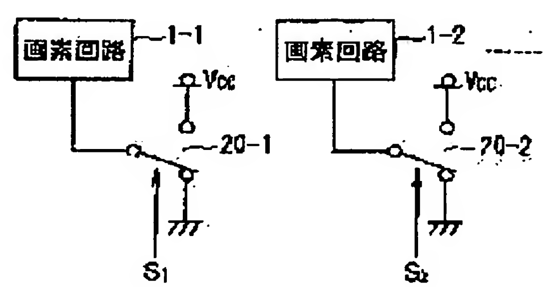
(54) DRIVING CIRCUIT INCLUDING ORGANIC ELECTROLUMINESCENCE ELEMENT, ELECTRONIC EQUIPMENT AND ELECTROOPTICAL DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an organic electroluminescence element driving circuit in which an application of a reverse bias is realized while hardly increasing power consumption and layout space.

SOLUTION: Switches 20-1 and 20-2 are provided so that organic electroluminescence elements are set into a reverse bias state. Then, each pixel unit, each line pixel unit constituting of a screen and all pixels simultaneously are set to a reverse bias state in a prescribed pixel unit. Thus, no need exists to add a power supply, a reverse bias application is realized while hardly increases power consumption and layout space and the service life of the elements is prolonged.



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CLAIMS

[Claim(s)]
[Claim 1] The drive circuit characterized by including the reverse bias setting circuit which two or more pixels containing an organic electroluminescent element are the drive circuits which carry out the active drive of the organic electroluminescence display arranged in the shape of a matrix, and sets said organic electroluminescent element as a reverse bias condition per predetermined field.
[Claim 2] The drive circuit characterized by including the reverse bias setting circuit which sets the organic electroluminescent element which two or more pixels containing an organic electroluminescent element are the drive circuits which carry out the active drive of the organic electroluminescence display arranged in the shape of a matrix, and is contained in the pixel in a predetermined field among said organic electroluminescent elements as a reverse bias condition.
[Claim 3] Said reverse bias setting circuit is a drive circuit according to claim 1 or 2 characterized by having the switch switched to either of the connection conditions with the 2nd power-source line which supplies the 2nd potential lower than the 1st connection condition and said 1st potential with a power-source line which supplies the 1st potential for the electric connection condition of one [at least] electrode of said organic electroluminescent element.
[Claim 4] Said reverse bias setting circuit is a drive circuit according to claim 1 or 2 characterized by having the switch switched to either of the connection conditions with the 2nd power-source line which supplies the 2nd potential lower than the 1st connection condition and said 1st potential with a power-source line which supplies the 1st potential for the electric connection condition by the side of the cathode of said organic electroluminescent element.
[Claim 5] Said switch is a drive circuit according to claim 3 or 4 characterized by setting said organic electroluminescent element as a reverse bias condition in each pixel unit by being prepared corresponding to each pixel and controlling said switch.
[Claim 6] Said switch is a drive circuit according to claim 3 to 5 characterized by setting said organic electroluminescent element as a reverse bias condition per one line by being prepared corresponding to each Rhine of said pixel, and controlling said switch.
[Claim 7] Said switch is a drive circuit according to claim 3 or 4 characterized by setting said organic electroluminescent element as a reverse bias condition at all pixel coincidence by preparing only one to said whole pixel and controlling this switch.
[Claim 8] Said switch is a drive circuit according to claim 3 or 4 characterized by setting said organic electroluminescent element as a reverse bias condition only about said specific pixel by being prepared only to a specific pixel and controlling this switch.
[Claim 9] The drive circuit characterized by two or more electro-optics components including the reverse bias setting circuit which is a drive circuit which drives the electro-optic device arranged in the shape of a matrix, and sets at least one electro-optics component as a reverse bias condition among said two or more electro-optics components.
[Claim 10] Electronic equipment by which it comes to mount a active-matrix mold display equipped with a drive circuit according to claim 1 to 6.
[Claim 11] The electro-optic device with which it is the electro-optic device which has the drive circuit where two or more pixels containing an electro-optics component carry out the active drive of the indicating equipment arranged in the shape of a matrix, and said drive circuit is characterized by including the reverse bias setting circuit which sets said electro-optics component as a reverse bias

condition per predetermined field.
[Claim 12] The electro-optic device with which two or more pixels containing an electro-optics component are the electro-optic devices which have the drive circuit which carries out the active drive of the indicating equipment arranged in the shape of a matrix, and said drive circuit is characterized by including the reverse bias setting circuit which sets the electro-optics component contained in the pixel in a predetermined field among said electro-optics components as a reverse bias condition.
[Claim 13] The electro-optic device according to claim 11 or 12 characterized by having the switch switched to either of the connection conditions with the 2nd power-source line which supplies the 2nd potential lower than the 1st connection condition and said 1st potential with a power-source line to which said reverse bias setting circuit supplies the 1st potential for the electric connection condition of one [at least] electrode of said electro-optics component.
[Claim 14] Said reverse bias setting circuit is an electro-optic device according to claim 11 or 12 characterized by having the switch switched to either of the connection conditions with the 2nd power-source line which supplies the 2nd potential lower than the 1st connection condition and said 1st potential with a power-source line which supplies the 1st potential for the electric connection condition by the side of the cathode of said electro-optics component.
[Claim 15] Said switch is an electro-optic device according to claim 13 or 14 characterized by setting said electro-optics component as a reverse bias condition in each pixel unit by being prepared corresponding to each pixel and controlling said switch.
[Claim 16] Said switch is an electro-optic device according to claim 13 to 15 characterized by setting said electro-optics component as a reverse bias condition per one line by being prepared corresponding to each Rhine of said pixel, and controlling said switch.
[Claim 17] Said switch is an electro-optic device according to claim 13 or 14 characterized by setting said electro-optics component as a reverse bias condition at all pixel coincidence by preparing only one to said whole pixel and controlling this switch.
[Claim 18] Said switch is an electro-optic device according to claim 13 or 14 characterized by setting said electro-optics component as a reverse bias condition only about said specific pixel by being prepared only to a specific pixel and controlling this switch.
[Claim 19] The electro-optic device with which it is the electro-optic device which has the drive circuit which drives the electro-optics component with which two or more electro-optics components were arranged in the shape of a matrix, and said drive circuit is characterized by including the reverse bias setting circuit which sets at least one electro-optics component as a reverse bias condition among said two or more electro-optics components.
[Claim 20] The electro-optic device according to claim 11 to 19 characterized by said electro-optics component being an organic electroluminescent element.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] About the drive circuit, the electronic equipment, and the electro-optic device of a active-matrix mold display which used the organic electroluminescence (Electro Luminescense) component, this invention relates to a drive circuit, electronic equipment, and an electro-optic device with the function which carries out reverse bias impression to an organic electroluminescent element, in order to control especially degradation of an organic electroluminescent element.
[0002]
[Description of the Prior Art] It is known by arranging two or more pixels which consist of an organic electroluminescent element which is one of the electro-optics components in the shape of a matrix that an organic electroluminescence display will be realizable. An organic electroluminescent element takes a configuration with the organic laminating thin film containing a luminous layer between the cathode by metal electrodes, such as Mg:Ag and AL:Li, and the anode plate by the transparent electrode which consists of ITO (Indium Tin Oxide).
[0003] The general configuration of the drive circuit of the active-matrix mold display using an organic electroluminescent element is shown in drawing 9 . In this drawing, the organic electroluminescent element is written as diode 10. Moreover, the drive circuit consists of two transistors Tr1 and Tr2 which consist of thin film transistors (TFT), and a capacitative element 2 which accumulates a charge.
[0004] Both the transistors Tr1 and Tr2 shall be TFT(s) of a P channel mold. The switch-on of a transistor Tr1 is controlled according to the charge accumulated in the capacitative element 2 in this drawing. Data-line VDATA performs charge of a capacitative element 2 through the transistor Tr2 turned on by making selection potential VSEL into a low level. If a transistor Tr1 is turned on, a current will flow to the organic electroluminescent element 10 through a transistor Tr1. By supplying this current to the organic electroluminescent element 10, the organic electroluminescent element 10 emits light continuously.
[0005] The easy timing chart about the circuit of drawing 9 is shown in drawing 10 . In performing data writing as shown in drawing 10 , by making selection potential VSEL into a low level, a transistor Tr2 is made into an ON state, and it charges a capacitative element 2. This charge period is the write-in period TW in this drawing. The period which actually displays comes after this write-in period TW. In this period, the switch-on of a transistor Tr1 is controlled by the charge accumulated in the capacitative element 2. This period is the display period TH in this drawing.
[0006] Moreover, other configurations of an organic electroluminescent element drive circuit are shown in drawing 11 . The drive circuit shown in this drawing is indicated by reference "The Impact of Transient Response of Organic Light Emitting Diodes on the Design of Active Matrix OLED Displays" (1998 IEEE IEDM 98-875). As for Tr1, in this drawing, a drive transistor and Tr2 are 2nd selection transistor from which a charge control transistor and Tr3 turn the 1st selection transistor to the charge period of a capacitative element 2, and Tr4 is turned off.
[0007] Even if a transistor is the thing of the same specification, there is dispersion in the property, as known well here. Therefore, even when the same electrical potential difference is impressed to the gate electrode of a transistor, a fixed current does not necessarily flow to a transistor and this may

become factors, such as brightness unevenness. However, the write-in current of the value according to a data signal can be supplied from a current source 4, can adjust the gate voltage of a transistor with a data signal, and, thereby, can control the luminescence condition of an organic electroluminescent element by this drive circuit.
[0008] Transistors Tr1-Tr4 are P channel mold transistors altogether, by making selection potential VSEL into a low level, transistors Tr2 and Tr3 are made into an ON state, and the charge of a value according to the output of a current source 4 is accumulated in a capacitative element 2. And after the selection potential VSEL will become high-level and Tr2 and Tr3 will be in an OFF state, the switch-on of a transistor Tr1 is controlled by the charge accumulated in the capacitative element 2, and when a transistor Tr4 is turned on with the data-hold control signal Vgp, the current according to the charge accumulated in the organic electroluminescent element 10 at the capacitative element 2 is supplied.
[0009] The easy timing chart about the circuit of drawing 11 is shown in drawing 12 . In performing the data writing by the current source 4 as shown in drawing 12 , by making selection potential VSEL into a low level, transistors Tr2 and Tr3 are made into an ON state, and it charges a capacitative element 2. This charge period is the write-in period TW in this drawing. Next, in potential VSEL, high-level, by making transistors Tr2 and Tr3 into an OFF state, and making the data-hold control signal Vgp into a low level, the switch-on of a transistor Tr1 is determined based on the charge accumulated in the capacitative element 2, and the current according to the charge accumulated in the capacitative element is supplied to the organic electroluminescent element 10. This period turns into the display period TH.
[0010] Still more nearly another configuration of an organic electroluminescent element drive circuit is shown in drawing 13 . The drive circuit shown in this drawing is a circuit indicated by JP,11-272233,A. In this drawing, the drive circuit is constituted including the drive transistor Tr1 which gives the current by the power source to the organic electroluminescent element 10 when turned on, the capacitative element 2 which accumulates the charge for controlling the switch-on of this transistor Tr1, and the charge control transistor Tr5 which controls the charge to a capacitative element 2 according to an external signal. In addition, when making the organic electroluminescent element 10 emit light, in order to make the charge control transistor Tr7 into an OFF state, potential Vrscan is held in the condition of a low level. Thereby, reset-signal Vrsig is not outputted. In addition, Tr6 is a transistor for adjustment.
[0011] In this drive circuit, when making the organic electroluminescent element 10 emit light, a transistor Tr5 is made into an ON state, and a capacitative element 2 is charged through a transistor Tr6 by data-line VDATA. What is necessary is to control the conductance between the source-drains of a transistor Tr1 according to this charge level, and just to pass a current to the organic electroluminescent element 10. That is, if potential Vscan is changed into a high-level condition in order to make a transistor Tr5 into an ON state as shown in drawing 14 , a capacitative element 2 will be charged through a transistor Tr6. According to this charge level, the conductance between the source-drains of a transistor Tr1 will be controlled, and a current will flow to the organic electroluminescent element 10.
[0012]
[Problem(s) to be Solved by the Invention] By the way, it is known that it is a means effective in the reinforcement of an organic electroluminescent element to impress a reverse bias to an organic electroluminescent element. This reinforcement is indicated by JP,11-8064,A, for example.
[0013] However, by the approach of this official report, when performing reverse bias impression to an organic electroluminescent element, additional power sources, such as a minus power source, are newly prepared, and it is necessary to control to apply a reverse bias to an organic electroluminescent element.
[0014] Then, this invention aims at offering the drive circuit, the electronic equipment, and the electro-optic device of an organic electroluminescent element which can impress a reverse bias to an organic electroluminescent element, without hardly being accompanied by the increment in power consumption or cost.
[0015]
[Means for Solving the Problem] Two or more pixels containing an organic electroluminescent

element are the drive circuits which carry out the active drive of the organic electroluminescence display arranged in the shape of a matrix, and suppose the 1st drive circuit of this invention that the reverse bias setting circuit which sets said organic electroluminescent element as a reverse bias condition per predetermined field is included.
[0016] Two or more pixels containing an organic electroluminescent element are the drive circuits which carry out the active drive of the organic electroluminescence display arranged in the shape of a matrix, and suppose the 2nd drive circuit of this invention that the reverse bias setting circuit which sets the organic electroluminescent element contained in the pixel in a predetermined field among said organic electroluminescent elements as a reverse bias condition is included.
[0017] The 3rd drive circuit of this invention is the above-mentioned drive circuit, and suppose said reverse bias setting circuit that it has the switch switched to either of the connection conditions with the 2nd power-source line which supplies the 2nd potential lower than the 1st connection condition and said 1st potential with a power-source line which supplies the 1st potential for the electric connection condition of one [at least] electrode of said organic electroluminescent element.
[0018] In short, since the connection condition of the 1st power source and the 2nd power source over a drive circuit is switched with a switch, it is not necessary to add a power source and a reverse bias can be impressed to an organic electroluminescent element, without hardly being accompanied by the increment in power consumption or cost. In this case, generally, the 1st power source is VCC, the 2nd power source is a gland (GND), and the potential currently prepared from the first is used. But if sufficient potential difference for making an organic electroluminescent element emit light is securable, it will not be limited to them.
[0019] The 4th drive circuit of this invention is the above-mentioned drive circuit, and suppose said reverse bias setting circuit that it has the switch switched to either of the connection conditions with the 2nd power-source line which supplies the 2nd potential lower than the 1st connection condition and said 1st potential with a power-source line which supplies the 1st potential for the electric connection condition by the side of the cathode of said organic electroluminescent element.
[0020] The 5th drive circuit of this invention is the above-mentioned drive circuit, and said switch is formed corresponding to each pixel, and suppose it that said organic electroluminescent element is set as a reverse bias condition in each pixel unit by controlling said switch.
[0021] The 6th drive circuit of this invention is the above-mentioned drive circuit, and said switch is formed corresponding to each Rhine of said pixel, and suppose it that said organic electroluminescent element is set as a reverse bias condition per one line by controlling said switch.
[0022] The 7th drive circuit of this invention is the above-mentioned drive circuit, and only one of said the switches is prepared to said whole pixel, and suppose them that said organic electroluminescent element is set as a reverse bias condition at all pixel coincidence by controlling this switch.
[0023] The 8th drive circuit of this invention is the above-mentioned drive circuit, and said switch is formed only to a specific pixel and suppose it that said organic electroluminescent element is set as a reverse bias condition only about said specific pixel by controlling this switch.
[0024] Two or more electro-optics components presuppose the 9th drive circuit of this invention that the reverse bias setting circuit which is a drive circuit which drives the electro-optic device arranged in the shape of a matrix, and sets at least one electro-optics component as a reverse bias condition among said two or more electro-optics components is included.
[0025] Suppose that it is the 1st electronic equipment of this invention electronic equipment by which it comes to mount a active-matrix mold display equipped with the above-mentioned drive circuit.
[0026] The 1st electro-optic device of this invention is an electro-optic device which has the drive circuit where two or more pixels containing an electro-optics component carry out the active drive of the indicating equipment arranged in the shape of a matrix, and suppose it that said drive circuit includes the reverse bias setting circuit which sets said electro-optics component as a reverse bias condition per predetermined field.
[0027] Two or more pixels containing an electro-optics component are the electro-optic devices which have the drive circuit which carries out the active drive of the indicating equipment arranged in the shape of a matrix, and said drive circuit presupposes the 2nd electro-optic device of this

invention that the reverse bias setting circuit which sets the electro-optics component contained in the pixel in a predetermined field among said electro-optics components as a reverse bias condition is included.
[0028] Said reverse bias setting circuit presupposes the 3rd electro-optic device of this invention that it has the switch switched to either of the connection conditions with the 2nd power-source line which supplies the 2nd potential lower than the 1st connection condition and said 1st potential with a power-source line which supplies the 1st potential for the electric connection condition of one [at least] electrode of said electro-optics component.
[0029] Said reverse bias setting circuit presupposes the 4th electro-optic device of this invention that it has the switch switched to either of the connection conditions with the 2nd power-source line which supplies the 2nd potential lower than the 1st connection condition and said 1st potential with a power-source line which supplies the 1st potential for the electric connection condition by the side of the cathode of said electro-optics component.
[0030] Said switch is formed corresponding to each pixel, and suppose the 5th electro-optic device of this invention that said electro-optics component is set as a reverse bias condition in each pixel unit by controlling said switch.
[0031] Said switch is formed corresponding to each Rhine of said pixel, and suppose the 6th electro-optic device of this invention that said electro-optics component is set as a reverse bias condition per one line by controlling said switch.
[0032] When only one of said the switches is prepared to said whole pixel and they control this switch, suppose the 7th electro-optic device of this invention that said electro-optics component is set as a reverse bias condition at all pixel coincidence.
[0033] Said switch is formed only to a specific pixel and the 8th electro-optic device of this invention presupposes it that said electro-optics component is set as a reverse bias condition only about said specific pixel by controlling this switch.
[0034] The 9th electro-optic device of this invention is an electro-optic device which has the drive circuit which drives the electro-optics component with which two or more electro-optics components were arranged in the shape of a matrix, and suppose it that said drive circuit includes the reverse bias setting circuit which sets at least one electro-optics component as a reverse bias condition among said two or more electro-optics components.
[0035] Suppose that said electro-optics component is the 10th electro-optic device of this invention an organic electroluminescent element.
[0036]
[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained with reference to a drawing. In addition, other drawings and equivalent parts are shown by the same sign in each drawing referred to in the following explanation.
[0037] (1) Reverse bias impression drawing 2 in the circuit of reverse bias impression ** drawing 9 to the conventional drive circuit is the circuit diagram showing one gestalt of operation of the drive circuit of the active-matrix mold display using the organic electroluminescent element by this invention. It is constituted by the organic electroluminescent element drive circuit of this example including the switch 20 for switching the cathode side of an organic electroluminescent element to the 1st potential (VCC) from the 2nd potential (GND) as shown in drawing 2 . What is necessary is just to connect a switch 20 to the 2nd potential (GND), in making the organic electroluminescent element 10 emit light. This condition becomes the same as the condition of drawing 9 mentioned above.
[0038] What is necessary is on the other hand, to make a transistor Tr1 into an OFF state, to switch a switch 20, and just to set it as the 1st potential (VCC), in order to impress a reverse bias to the organic electroluminescent element 10. Since the potential by the side of the anode plate of an organic electroluminescent element cannot become more than the 1st potential (VCC) at this time, a reverse bias will be impressed to the organic electroluminescent element 10.
[0039] However, at this time, when the parasitic capacitance C by the side of the anode plate of an organic electroluminescent element is small, the potential change by the side of the cathode of an organic electroluminescent element, i.e., the potential rise to the 1st potential (VCC) from the 2nd potential (GND), is followed, the potential by the side of an anode plate also rises, and a reverse bias

is not sometimes fully impressed. In order to impress sufficient reverse bias, it is required to suppress the potential rise by the side of an anode plate, and it is possible to enlarge wiring parasitic capacitance C by the side of an anode plate as the means. By enlarging parasitic capacitance C by the side of an anode plate, it becomes possible to impress a big reverse bias, and degradation prevention of an organic electroluminescent element can be performed effectively.

[0040] Then, how to enlarge parasitic capacitance by the side of an anode plate is explained using drawing 3 . First, the general cross-section structure of an organic electroluminescent element is explained using drawing 3 (a).

[0041] The semi-conductor thin film layer is formed on the glass substrate 81. The source field 82 and the drain field 85 of a transistor are formed in the semi-conductor thin film layer. The gate insulating layer 83 has covered the source field 82 and the drain field 85 of a transistor. The gate electrode 84 of a transistor is formed on the gate insulating layer 83. The insulating layer 86 has covered the gate electrode 84 and the gate insulating layer 83 between the 1st layer. The connection hole is formed in the insulating layer 86 between the gate insulating layer 83 and the 1st layer. The source field 82 and the drain field 85, and the source electrode 87 and the drain electrode 91 of a transistor are connected by embedding an electrical conducting material at a connection hole. The insulating layer 88 has covered the insulating layer 86 between the source electrode 87, the drain electrode 91, and the 1st layer between the 2nd layer. The drain electrode 91 is connected to the organic laminating thin film which contains a luminous layer 95 through the anode plate 89 which becomes since it consists of ITO. The organic laminating thin film contains the hole injection layer 93 and the luminous layer 95 at least. The cathode 97 of an organic electroluminescent element is formed on the organic laminating thin film. With the switch 20 which mentioned the potential of this cathode 97 above, it switches to the 1st potential (VCC) from the 2nd potential (GND).

[0042] Next, how to enlarge parasitic capacitance by the side of an anode plate is explained concretely.

[0043] (i) -- near wiring between the anode plate 89 of the parasitic capacitance organic electroluminescent element between a source electrode and a drain electrode, and a transistor -- a conductor -- a member is prepared and parasitic capacitance is constituted between wiring. That is, parasitic capacitance C can be enlarged by making spacing of the source electrode 87 and the drain electrode 91 narrower than usual, or enlarging area of the part which two electrodes counter compared with other parts as shown in drawing 3 (b). That is, parasitic capacitance C is constituted between the source electrode of a drive transistor, and a drain electrode.

[0044] (ii) Parasitic capacitance between this metal layer 92 and the drain electrode 91 can be enlarged by forming the metal layer 92 in an insulating layer 86 between the 1st layer as shown in the parasitic capacitance and drawing 3 (c) between the metal layers prepared in the insulator layer layer. That is, parasitic capacitance C is constituted between the metal layers 92 and the drain electrodes 91 which were prepared in the insulating layer 86 between the 1st layer.

[0045] Anyway, since an organic electroluminescent element changes into a luminescence condition or a reverse bias condition and it moreover is not necessary to newly prepare the supply voltage of minus only by switching a setup of a switch 20, power consumption does not increase or a layout tooth space does not increase. In addition, this switch 20 is easily realizable combining a transistor.

[0046] ** If a switch 20 is formed in the cathode side of the organic electroluminescent element 10 and this switch 20 is switched to the 1st potential (VCC) from the 2nd potential (GND) as shown in reverse bias impression drawing 4 in the circuit of drawing 11 , the organic electroluminescent element 10 can be set as a reverse bias condition like the case of drawing 2 using parasitic capacitance C.

[0047] ** What is necessary is just to add a switch 20 to the cathode side of the organic electroluminescent element 10 also about the drive circuit shown in the reverse bias impression pan in the circuit of drawing 13 at drawing 13 mentioned above, as shown in drawing 5 . And the cathode side of an organic electroluminescent element is switched to the 2nd potential (GND) from the 1st potential (VCC) with this switch 20. Thereby, the organic electroluminescent element 10 can be set as a reverse bias condition using parasitic capacitance C.

[0048] (2) It is at the reverse bias impression to a predetermined unit, and the time, and when it constitutes a display using an organic electroluminescent element, each organic electroluminescent

element corresponds to one pixel. For this reason, in the configuration of drawing 2 - drawing 5 mentioned above, a switch will be formed for every organic electroluminescent element and every pixel circuit.
[0049] ** Each pixel circuit 1-1 and 1-2 -- which have an organic electroluminescent element in reverse bias impression drawing 1 for every pixel, and the switch 20-1 corresponding to these, 20-2 -- Connection relation is shown.
[0050] In this drawing, a switch 20-1 will be formed corresponding to the pixel circuit 1-1 which has an organic electroluminescent element, and the switch 20-2 will be formed corresponding to the pixel circuit 1-2. That is, the switch mentioned above to each of each pixel is formed. And change control of these switches is carried out with control signals S1 and S2. This control signal is inputted at the period except the period which is making the period and the organic electroluminescent element which have charged the capacitor in each pixel circuit emit light, and carries out change control of each switch. For example, if the example of drawing 4 mentioned above is taken for an example, this control signal S is easily generable with reference to the data-hold control signal Vgp which defines the selection electrical potential difference VSEL which defines the write-in period TW, and the display period TH. That is, periods other than the write-in period TW by the selection electrical potential difference VSEL and the display period TH by the data-hold control signal Vgp will be made into the reverse bias period TB as shown in drawing 6 (a).
[0051] ** Reverse bias impression and the switch mentioned above may be formed for every Rhine corresponding to each Rhine of the pixel which constitutes a screen. That is, a switch 20-1 is formed to the pixel circuit 1-11 and Rhine by 1-12 --, and a switch 20-2 is formed to the pixel circuit 1-21 and Rhine by 1-22 -- as shown in drawing 7 . When forming one switch to each Rhine, rather than the case of drawing 1 , the number of switches can be lessened and low cost-ization can be attained.
[0052] Thus, when carrying out the seal of approval of the reverse bias in each Rhine unit of a pixel and a certain Rhine is the reverse bias period TB as shown in drawing 6 (b), other Rhine will be the write-in period TW or the display period TH. Thus, by forming the above-mentioned switch corresponding to two or more Rhine of each which constitutes one screen, it can be periodically set as a reverse bias condition in each Rhine unit, and reinforcement of an organic electroluminescent element can be attained.
[0053] About a certain Rhine, the reverse bias period TB or the write-in period TW comes [circuit / which can realize the reverse bias period TB and the write-in period TW to coincidence / pixel], and the display period TH comes about other Rhine as shown in drawing 6 (c).
[0054] ** Only the one above-mentioned switch may be formed to the whole pixel which constitutes a screen at a reverse bias impression pan in all pixel coincidence, and an organic electroluminescent element may be set as a reverse bias condition by controlling this switch at all pixel coincidence about the pixel which constitutes a screen. In this case, one switch 20 is formed to the pixel circuit 1-11, 1-12 -- and the pixel circuit 1-21, and the screen constituted by 1-22 --, and all pixels are set as a reverse bias condition with this switch 20 at coincidence as shown in drawing 8 . When forming only one switch to all pixels, the number of switches can be made into the minimum and low cost-ization can be attained more.
[0055] What is necessary is just to establish the reverse bias period TB of predetermined die length in the one-frame period F, as it was called die length comparable as the write-in period TW and the display period TH as shown in drawing 6 (d) when setting all pixels as a reverse bias condition at coincidence. Although the reverse bias period TB was formed in the head location in the one-frame period F and the write-in period TW and the display period TH are continuously established after that in this drawing, the location of the reverse bias period TB in the one-frame period F is arbitrary, and good.
[0056] ** When it is at reverse bias impression and the time and realizes a electrochromatic display by the organic electroluminescent element only to a specific pixel, the organic electroluminescence ingredient which has red, green, and the different luminescent color like blue may be used. Generally, when organic electroluminescence ingredients differ, a difference arises to the life. Therefore, when two or more organic electroluminescence ingredients constitute a display, the life of the organic electroluminescence ingredient of a short life will determine the life of a display most. Then, it is possible only to a specific pixel to carry out reverse bias impression. In this case, the

following two approaches can be considered. (i) How to perform processing changed into a reverse bias condition only about the organic electroluminescent element which displays the pixel of a short life. (ii) The count which impresses a reverse bias to the organic electroluminescent element which displays the pixel of a short life is made [more] than the count which impresses a reverse bias to other organic electroluminescent elements. The life of the whole display screen can be prolonged also in such an approach.
[0057] Moreover, in the organic electroluminescence display which displays a display screen by specific colors, such as orange, blue, and green, partially, for example and which performs the so-called area display, you may change into a reverse bias condition only about the organic electroluminescent element which displays the short area of a life. Also in this case, the life of the display screen can be prolonged.
[0058] By the way, although the drive circuit of the active-matrix mold display which used the organic electroluminescent element was explained above, the applicability of this invention is not restricted to this, for example, can be applied also to the display of the active-matrix mold using electro-optics components other than organic electroluminescent elements, such as TFT-LCD, FED (Field Emission Display), an electrophoresis component and an electric-field reversal component, laser diode, and LED.
[0059] Some examples of the electronic equipment which applied the active-matrix mold display constituted by next having the drive circuit 1 explained above are explained. Drawing 15 is the perspective view showing the configuration of the personal computer of the mobile mold which applied this active-matrix mold indicating equipment. In this drawing, the personal computer 1100 was constituted by the body section 1104 equipped with the keyboard 1102, and the display unit 1106, and this display unit 1106 is equipped with said active-matrix mold display 100.
[0060] Moreover, drawing 16 is the perspective view showing the configuration of the portable telephone which applied the active-matrix mold display 100 constituted by having the above-mentioned drive circuit to the display. In this drawing, the portable telephone 1200 is equipped with the aforementioned active-matrix mold display 100 with the ear piece 1204 besides two or more manual operation buttons 1202, and the speaker 1206.
[0061] Moreover, drawing 17 is the perspective view showing the configuration of the digital still camera which applied the active-matrix mold indicating equipment 100 constituted by having the above-mentioned drive circuit to the finder. In addition, it is shown in this drawing in [connection / with an external instrument] simple. To the here usual camera exposing a film according to the light figure of a photographic subject, the digital still camera 1300 carries out photo electric conversion of the light figure of a photographic subject with image sensors, such as CCD (Charge Coupled Device), and generates an image pick-up signal. The active-matrix mold display 100 is formed, it has composition which displays based on the image pick-up signal by CCD, and the active-matrix mold display 100 functions on the tooth back of the case 1302 in the digital still camera 1300 as a finder which displays a photographic subject. Moreover, the light-receiving unit 1304 containing an optical lens, CCD, etc. is formed in the case 1302 observation-side (setting to drawing rear-face side).
[0062] When a photography person checks the photographic subject image displayed on the drive circuit and does the depression of the shutter carbon button 1306, the image pick-up signal of CCD at the time is transmitted and stored at the memory of the circuit board 1308. Moreover, if it is in this digital still camera 1300, the video signal output terminal 1312 and the input/output terminal 1314 for data communication are formed in the side face of a case 1302. And as shown in drawing, a personal computer 1430 is connected to the input/output terminal 1314 for the latter data communication for a television monitor 1430 again at the former video signal output terminal 1312 if needed, respectively. Furthermore, the image pick-up signal stored in the memory of the circuit board 1308 by predetermined actuation has a television monitor 1430 and composition outputted to a personal computer 1440.
[0063] In addition, as electronic equipment by which the active-matrix mold display 100 of this invention is applied, ****** equipped with the video tape recorder of a liquid crystal television, and a viewfinder mold and a monitor direct viewing type, the car navigation equipment, the pager, the electronic notebook, the calculator, the word processor, the workstation, the TV phone, POS terminal, and touch panel other than the personal computer of drawing 15 , the cellular phone of

drawing 16 , and the digital still camera of drawing 17 etc. is mentioned. And it cannot be overemphasized that the active-matrix mold display 100 mentioned above can be applied as a display of these various electronic equipment.

[0064]

[Effect of the Invention] As explained above, since this invention sets an organic electroluminescent element as a reverse bias condition per predetermined pixel, it can realize reverse bias impression, without hardly being accompanied by the increment in power consumption, or increase of a layout tooth space, and is effective in the ability to attain reinforcement of an organic electroluminescent element. Moreover, by using parasitic capacitance, reverse bias impression can be realized without adding a power source, and it is effective in the ability to attain reinforcement of an organic electroluminescent element.

[Translation done.]

DESCRIPTION OF DRAWINGS

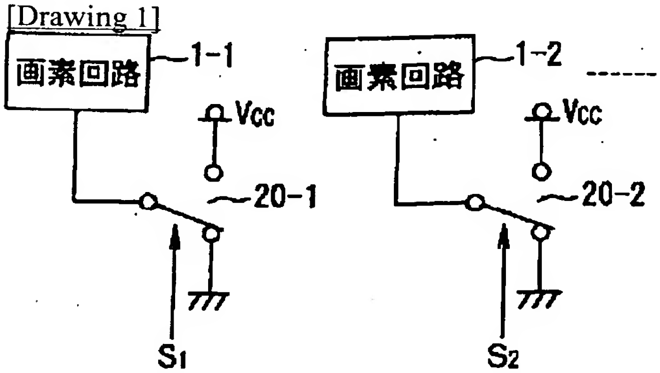
[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing one gestalt of operation of the organic electroluminescent element drive circuit by this invention.
[Drawing 2] It is the block diagram showing the example of a configuration of the organic electroluminescent element drive circuit by this invention.
[Drawing 3] It is drawing showing the cross-section configuration of the pixel circuit in the organic electroluminescent element drive circuit by this invention.
[Drawing 4] It is the block diagram showing other examples of a configuration of the organic electroluminescent element drive circuit by this invention.
[Drawing 5] It is the block diagram showing other examples of a configuration of the organic electroluminescent element drive circuit by this invention.
[Drawing 6] It is the wave form chart showing actuation of the organic electroluminescent element drive circuit by this invention.
[Drawing 7] It is the block diagram showing other gestalten of operation of the organic electroluminescent element drive circuit by this invention.
[Drawing 8] It is the block diagram showing other gestalten of operation of the organic electroluminescent element drive circuit by this invention.
[Drawing 9] It is the block diagram showing the example of a configuration of the conventional organic electroluminescent element drive circuit.
[Drawing 10] It is the wave form chart showing actuation of the organic electroluminescent element drive circuit of drawing 9 .
[Drawing 11] It is the block diagram showing other examples of a configuration of the conventional organic electroluminescent element drive circuit.
[Drawing 12] It is the wave form chart showing actuation of the organic electroluminescent element drive circuit of drawing 11 .
[Drawing 13] It is the block diagram showing other examples of a configuration of the conventional organic electroluminescent element drive circuit.
[Drawing 14] It is the wave form chart showing actuation of the organic electroluminescent element drive circuit of drawing 13 .
[Drawing 15] It is drawing showing an example at the time of applying the active-matrix mold indicating equipment equipped with the drive circuit by one example of this invention to the personal computer of a mobile mold.
[Drawing 16] It is drawing showing an example at the time of applying the active-matrix mold display equipped with the drive circuit by one example of this invention to the display of a portable telephone.
[Drawing 17] It is drawing showing the perspective view of the digital still camera which applied the active-matrix mold indicating equipment equipped with the drive circuit by one example of this invention to the finder part.
[Description of Notations]
1-1, 1-2, 1-11 Pixel circuit
1-12, 1-21, 1-22 Pixel circuit
2 Capacitor

4 Current Source
10 Organic Electroluminescent Element
20, 20-1, 20-2 Switch
C Parasitic capacitance
Tr1-Tr7 Transistor

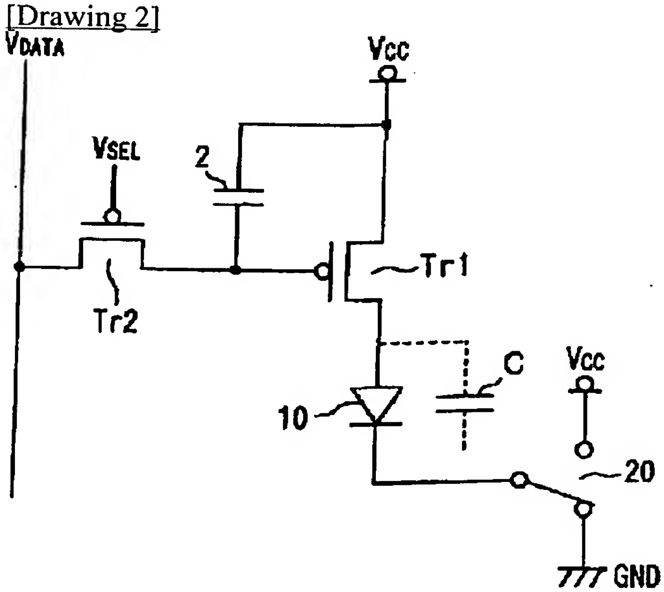
[Translation done.]

DRAWINGS

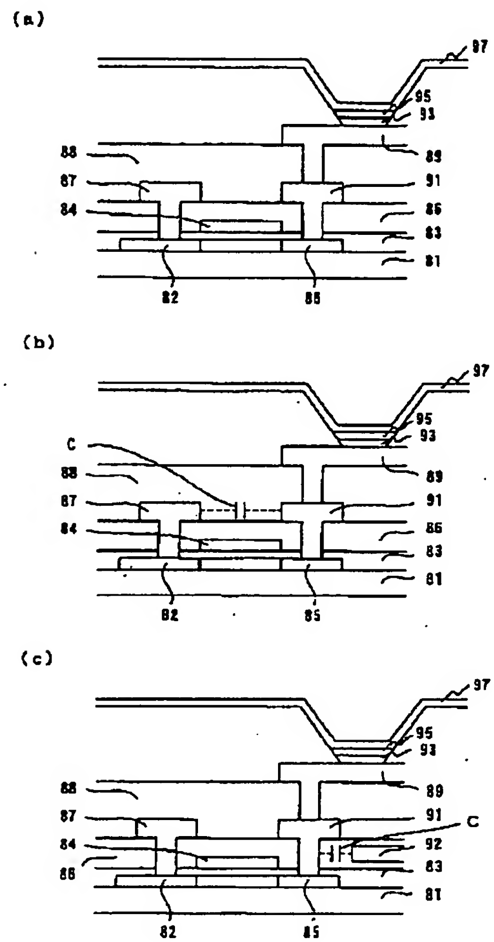
[Drawing 1]



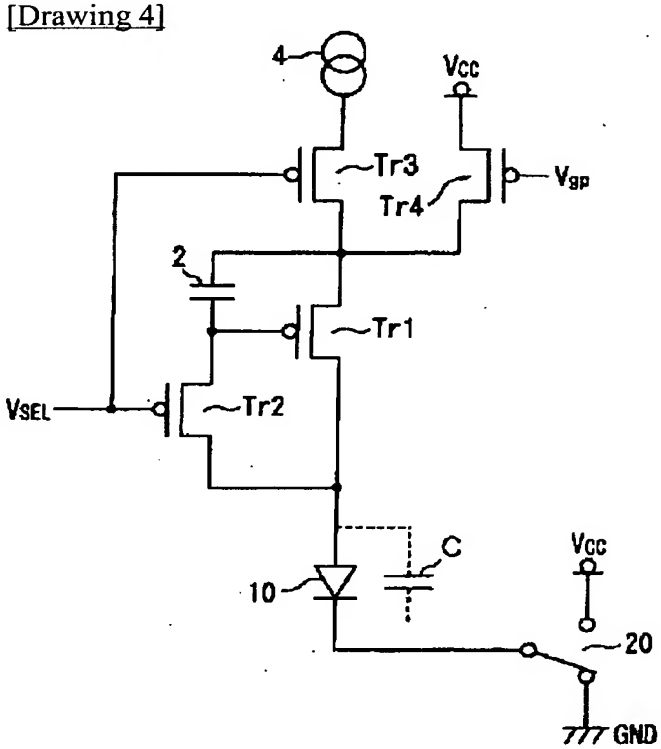
[Drawing 2]



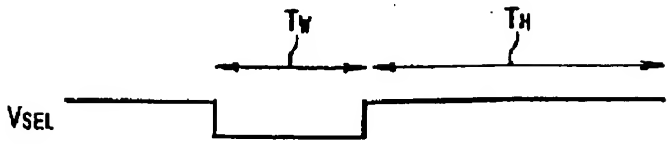
[Drawing 3]



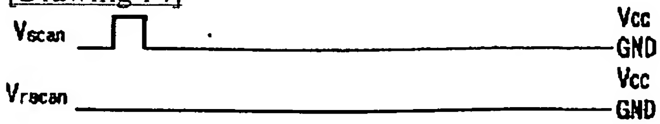
[Drawing 4]



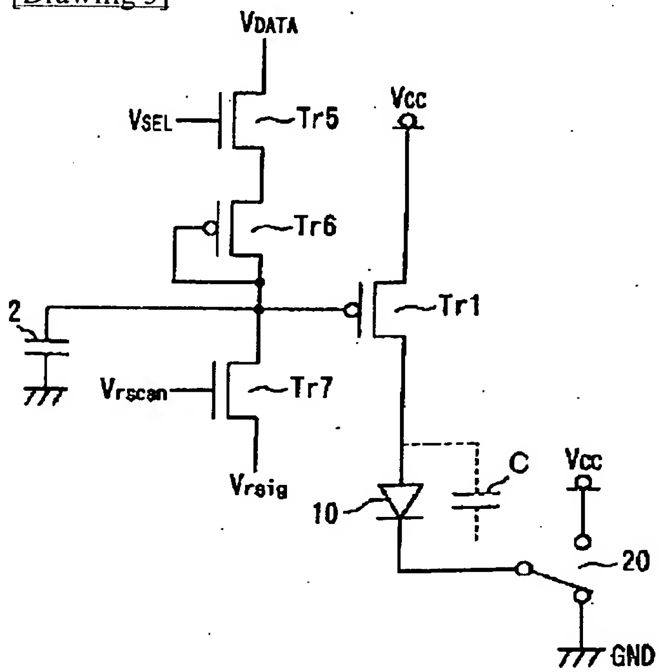
[Drawing 10]



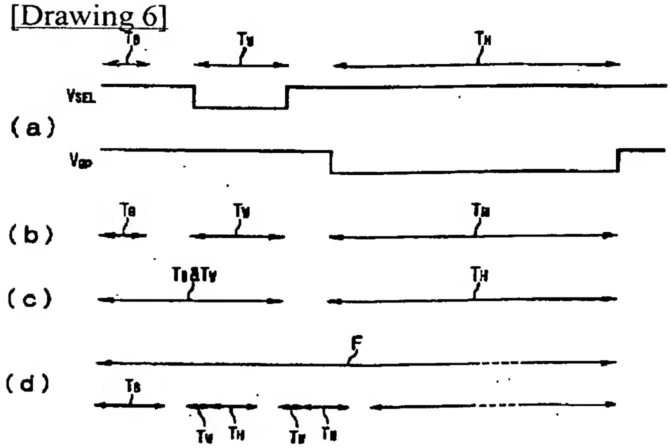
[Drawing 14]



[Drawing 5]



[Drawing 6]



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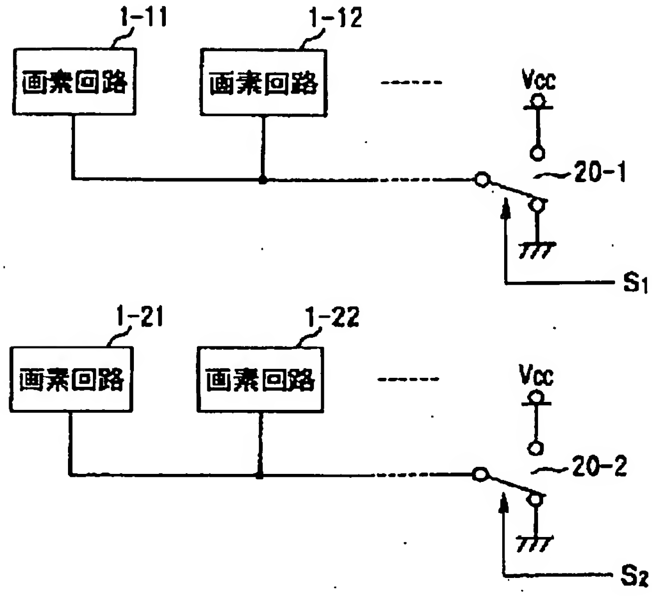
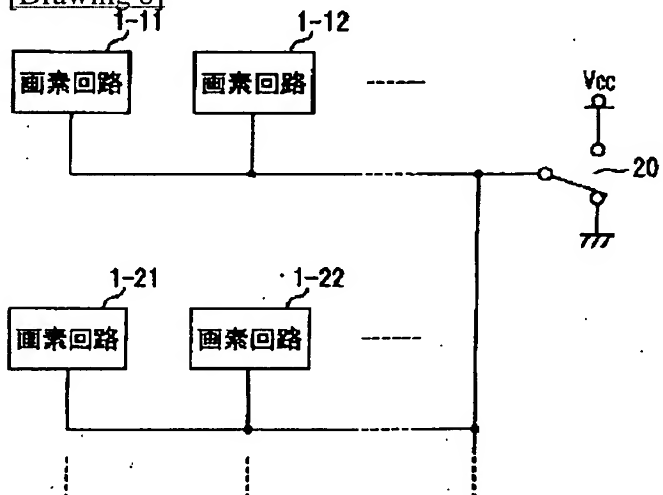
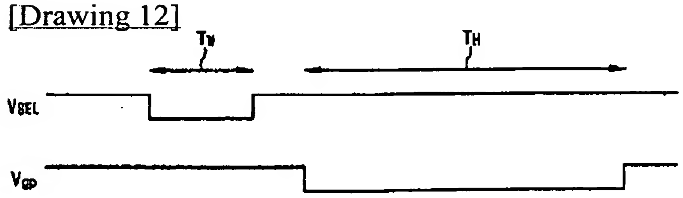


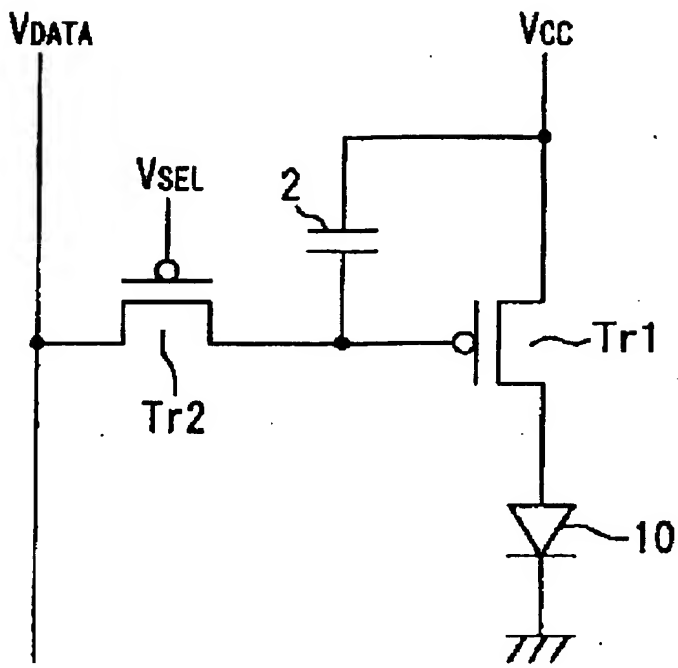
[Drawing 8]



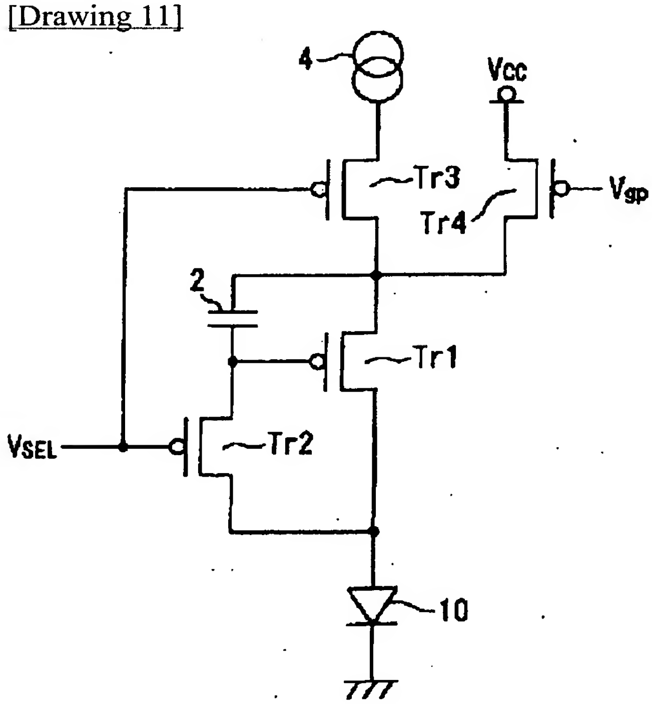
[Drawing 12]



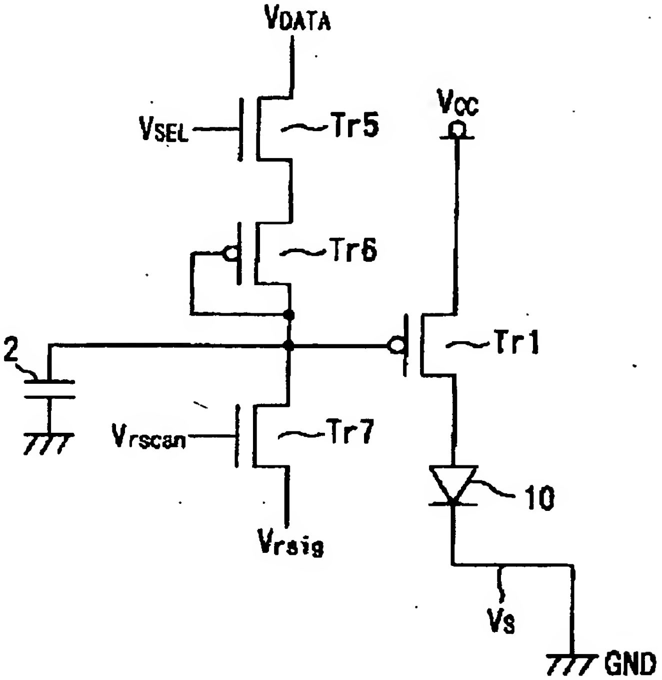
[Drawing 9]



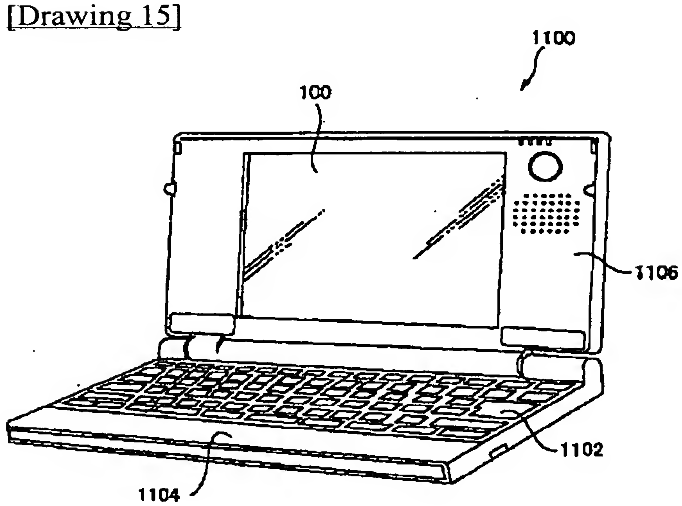
[Drawing 11]



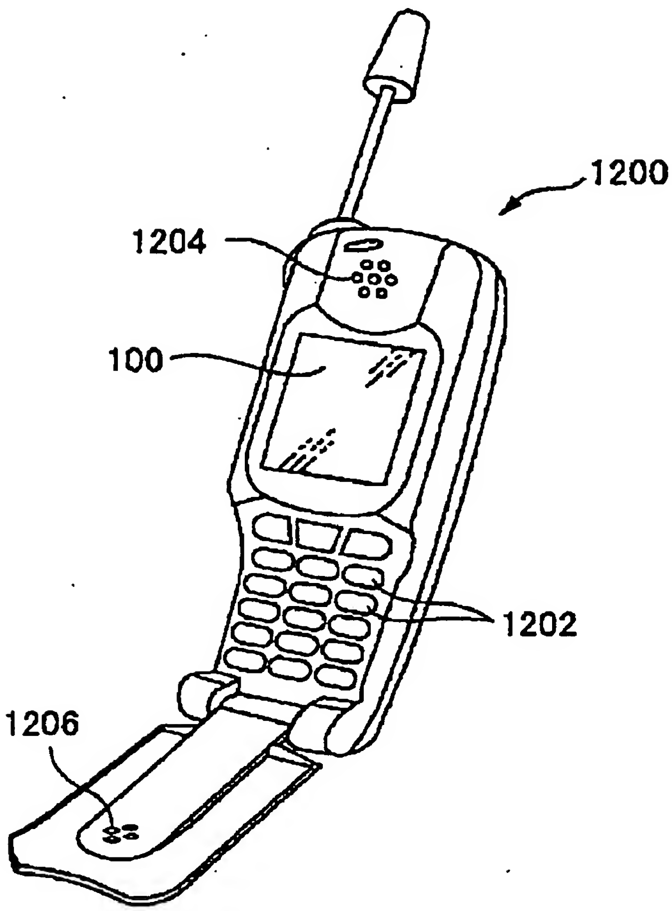
[Drawing 13]



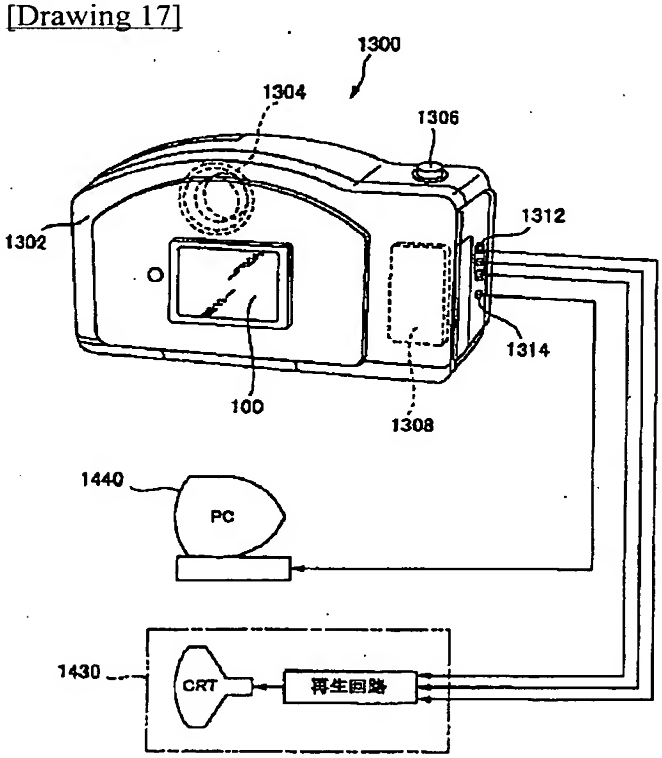
[Drawing 15]



[Drawing 16]


1200
1204
100
1202
1206

[Drawing 17]


1300
1304
1306
1312
1302
1314
100
1308
1440
PC
1430
CRT
再生回路

[Translation done.]